

State of California  
AIR RESOURCES BOARD

PROPOSED AMENDMENTS TO THE  
CALIFORNIA CLEANER-BURNING GASOLINE REGULATIONS

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State of California  
AIR RESOURCES BOARD

**Staff Report: Initial Statement of Reasons  
For Proposed Rulemaking**

Public Hearing to Consider  
PROPOSED AMENDMENTS TO THE  
CALIFORNIA CLEANER-BURNING GASOLINE REGULATIONS

To be considered by the Air Resources Board on August 27-28, 1998 at:

Air Resources Board  
Board Hearing Room  
Lower Level  
2020 L Street  
Sacramento, California

Air Resources Board  
P.O. Box 2815  
Sacramento, CA 95812

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## **I.**

### **INTRODUCTION AND SUMMARY**

This report is the Initial Statement of Reasons by the staff of the Air Resources Board (ARB) to support proposed amendments to the California Reformulated Gasoline (CaRFG) Regulations (13 CCR, section 2250 et seq; also known as the “cleaner-burning gasoline regulations”). The amendments include (1) rescinding the winter minimum oxygen content requirement for gasoline in certain areas of this state, (2) increasing the maximum limit on oxygen content in gasoline allowed under the Predictive Model, and (3) making minor technical changes. The proposed amendments will be considered at a Board hearing on August 27 or 28, 1998.

The CaRFG regulations were first adopted in November 1991 and took effect in March 1996. The initial regulations set limits for eight properties of gasoline (discussed in Chapter III). There have been four sets of amendments since 1991. In 1994, the Board added a mechanism for defining alternative limits through use of the California Predictive Model. In 1995, the Board added provisions to allow the addition of oxygenates at downstream pipeline terminals, and (in a separate action) amended the test methods for measuring the amounts of benzene, aromatic hydrocarbons, sulfur, and olefins in gasoline. In 1996, the provisions controlling variances from the regulations were amended.

#### **A. Development of the Current Proposal**

In February 1998, the Western States Petroleum Association (WSPA), acting on the behalf of a broad range of California refinery operators, requested that the ARB consider several changes and additions to the CaRFG regulations to provide refiners with more compliance flexibility. In making this request, WSPA recognized that preserving the emission reductions achieved by the current regulations was essential, and that changes made to increase flexibility could not result in weakening the current regulations. Specifically, WSPA requested that the following changes be investigated:

- Updating and other changes to the Predictive Model to incorporate vehicle emission test data that have become available since the model was adopted in 1994;
- The addition of an evaporative hydrocarbon emission model to the Predictive Model;

- Increasing the cap limits for the aromatic, oxygen, and olefinic contents and the T50 and T90 distillation points;
- Rescinding the winter minimum oxygen requirement.

WSPA is seeking additional flexibility to adjust the type and amount of oxygenate used in gasoline, and also hopes to gain more flexibility relative to the other regulated fuel parameters. However, the staff and WSPA recognize that federal laws and regulations require two percent oxygen year-round in about 70 percent of California's gasoline and that practical use of most of the benefits of additional flexibility under the CaRFG regulations would be limited unless federal law is amended to allow full use of the CaRFG program. H.R. 630 (Bilbray) and a companion bill by Senator Feinstein have been introduced in Congress to provide the changes needed for refiners to manage the amount of oxygenates in gasoline. Unfortunately, it is doubtful that such legislation will be enacted this year.

The staff agreed to consider WSPA's requests with the understanding that any changes to the regulations must preserve the real-world effectiveness of the cleaner-burning gasoline program before they could be proposed.

An initial public workshop was held on March 23, 1998. At the workshop, the staff announced that it would hold bi-weekly public consultation meetings at which the technical issues related to WSPA's proposal would be discussed with WSPA and other interested parties. These meetings were held on April 7, April 21, May 5, and May 19, 1998. After these meetings, a second public workshop was held on June 5, 1998. The staff gave written invitations to the meetings to the Integrated Waste Management Board, the Water Resources Control Board, the Office of Environmental Health Hazard Assessment, and the Department of Toxic Substances Control (see Appendix B).

After extensive technical work by staff and others, we have found that the technical tasks and issues associated with adding an evaporative emission model to the Predictive Model, revising the existing exhaust models within the Predictive Model, and raising cap limits (other than for oxygen) cannot be resolved in time for a hearing in 1998. Furthermore, the prospects for gaining essential flexibility under federal law this year are very low, and without such flexibility, changes to the CaRFG program would have limited benefits. Therefore, we are not proposing to pursue, and WSPA has indicated that they generally concur, most of the changes requested by WSPA at this time. However, we are proposing that the oxygen cap limit be raised to 3.5 percent by weight that the minimum oxygen limit for winter gasoline be rescinded in the areas that are now designated as attainment for the federal standards for carbon monoxide. The staff intends to continue work on updating the Predictive Model. That work could eventually lead to the kind of flexibility requested by WSPA (if federal law is changed).

Also, we are proposing some changes to correct minor technical problems in the regulations. These changes are:

- Granting extra compliance time at the beginning of the winter oxygen season to retail stations that have infrequent deliveries;
- Correcting drafting errors in the existing provisions on averaging;
- Making the application of the RVP limit to gasoline shipped from northern refineries to southern marine terminals uniform with its application to gasoline imported from out-of-state;
- Exempting racing fuel from the CaRFG standards.

## **II.**

### **RECOMMENDATION**

The staff recommends that the Board adopt the proposed draft amendments to the CaRFG regulations as presented in Appendix A.

### **III.**

#### **BACKGROUND**

This chapter discusses the government regulations for gasoline, including federal regulations, and the emission benefits of the CaRFG regulations.

##### **A. Government Regulations**

###### Federal Gasoline Programs

The 1990 amendments to the CAA require the use of oxygenates in areas with poor air quality and are the driving force behind the increased use of oxygenates. Oxygenates were first required by federal statute to reduce exhaust emissions of carbon monoxide (CO) in 39 areas that exceeded the national ambient air quality standard (NAAQS) for CO. The CAA required states to implement by November 1992 an oxygenated gasoline program to reduce CO emissions during the winter. The state programs were to require that gasoline sold in the specified CO non-attainment areas during the winter months contain oxygen at a minimum level of 2.7 weight percent, unless the state obtains a waiver from the U.S. EPA authorizing a lower minimum oxygen standard.

In addition to the winter oxygen program, the 1990 CAA amendments also set up a two-phase program requiring federal reformulated gasoline (RFG) in areas in violation of the ozone air quality standard. The CAA required federal RFG to contain an average of at least 2 percent oxygen year round, no more than one percent benzene, and no heavy metals. The CAA further required a 15 percent reduction in both volatile organic compounds (VOC) and toxic emissions in 1995 and an additional 10 percent reduction in both in 2000. Compliance with the percentage reductions are to be based on emissions impacts relative to a prescribed average base gasoline used in vehicles representative of 1990 technology. To implement these requirements, the U.S. EPA established a two-phase approach. Under Phase I, which began on January 1, 1995, the oxygen requirement and other gasoline specifications were established to reduce volatile organic compound emissions and toxic air pollutants by



15 percent. During Phase II of the federal RFG program, to start in the year 2000, the U.S. EPA's rules require oxides of nitrogen (NO<sub>x</sub>) reductions of 5.5 percent along with further reductions in volatile organic compounds and toxic emissions.

About 30 percent of the gasoline sold nationwide is used in areas that have extreme or severe ozone air quality designations, and must meet the federal RFG requirements. Areas that have less severe ozone pollution but still exceed the ozone standard may also “opt in” to the federal RFG program as an emission control measure to reduce motor vehicle emissions and maintain the ambient air quality standards. In California, the federal RFG requirements apply in most of southern California and in Sacramento, areas where about 70 percent of the state's gasoline is consumed. This gasoline is required by federal law to contain an average of at least two weight-percent oxygen year-round.

### California's Gasoline Programs

*Winter Oxygen:* To comply with the CAA requirements for a wintertime gasoline oxygenate program in CO nonattainment areas, in 1991 the ARB adopted an interim program requiring oxygen in gasoline during the winter months from November 1992 through February 1996. However, because of the adverse effect of high levels of oxygenates on NO<sub>x</sub> emissions, California requested from the U.S. EPA a waiver from the 2.7 percent oxygen requirement in the CAA. The ARB requires 1.8 to 2.2 weight-percent oxygen in its winter gasoline to limit increases in NO<sub>x</sub> emissions. The wintertime oxygenated gasoline program was adopted as a statewide requirement because about 80 percent of the gasoline used in California occurred in what were then CO nonattainment areas. The winter oxygen requirements were continued in the cleaner-burning gasoline regulations described below.

In part because of its wintertime oxygenated gasoline program, California no longer has violations of the NAAQS for CO, except in two counties (one of which is not a federal CO nonattainment area). In response, the U.S. EPA has recently re-designated 10 of the state's CO nonattainment areas (see Appendix D), and only the greater Los Angeles area remains nonattainment for the federal CO standard. Once an area is re-designated as attainment, the CAA continues to require a wintertime oxygenates program only to the extent the program is necessary to maintain the CO standard.

*Cleaner-Burning Gasoline:* In 1991, the ARB also adopted its cleaner-burning gasoline regulations which became effective on March 1, 1996. The regulations include limits for eight gasoline properties. These limits are shown in Table II-1. California refiners may comply with the regulations in any one of three ways. Each gasoline producer may choose either the flat limit or the averaging limit (if applicable) in the table. The flat limit applies to each batch of finished gasoline. The averaging limit must not be exceeded by the rolling 180-day average value of the fuel property. Also, gasoline producers may use a mathematical Predictive Model that allows them to vary the composition of their gasolines as long as they achieve equivalent emission reductions. Refiners can use the Predictive Model to set alternative values of the flat or averaging limits which must not exceed the cap limits. Refiners may also conduct motor vehicle testing to certify alternative blends. No refiner has used this option, to date.

As noted above, the federal RFG regulations, which apply to about 70 percent of California's gasoline, require a minimum 1.5 weight percent oxygen in any gallon and an average of 2.0 weight percent. In concert with the RFG regulations, California's cleaner-burning gasoline regulations specify a basic oxygen content of 1.8 to 2.2 weight percent. However, in the non-winter seasons, refiners can use the Predictive Model to reduce or even eliminate the use of oxygen in areas of the state not subject to federal RFG requirements.

**Table III-1. Basic Limits for Cleaner Burning Gasoline**

Property	Flat Limit	Averaging Limit	"Cap" Limit*
Reid vapor pressure (RVP), psi, max	7.0	---	7.0
Benzene, vol.percent, max	1.00	0.80	1.20
Sulfur, ppmw, max	40	30	80
Aromatic HC, vol.percent, max	25	22	30
Olefins, vol.percent, max	6.0	4.0	10
Oxygen, wt.percent	1.8 to 2.2	---	1.8 (min)** - 2.7 (max)
T50 (temperature at 50 percent distilled) deg. F, max	210	200	220
T90 (temperature at 90 percent distilled) deg. F, max	300	290	330

\* The "caps" apply to all gasoline at any place in the marketing system

\*\* The 1.8 wt. percent minimum oxygen specification is only in force during the winter

## **B. Emission Benefits of CaRFG Regulations**

California's cleaner-burning gasoline, which typically includes oxygen, has substantial benefits and is vital to our efforts to restore California's air quality. Cleaner-burning gasoline reduces emissions from gasoline vehicles as shown in Table III-2. These emission reductions are essential for attainment of the air quality standards for ozone, CO, and particulate matter. California's cleaner-burning gasoline also results in approximately a 40 percent reduction in the potential cancer risk associated with exposure to toxic air contaminants from motor vehicles. These emissions benefits are achieved, in part, by the use of oxygenates in the gasoline or the equivalent effect under the Predictive Model.

**Table III-2. Emission Reductions from Cleaner Burning Gasoline  
(on-road gasoline-powered vehicles)**

	Percent Reduction
Hydrocarbons	17
NOx	11
CO	11
Sulfur oxides	80
Potency-weighted toxics	40

On average, gasoline produced and used in the state is cleaner than required by the regulations. As a result, the table under-estimates the actual reductions in emissions.

Air monitoring since the inception of the CaRFG regulations has recorded major reductions in ambient concentrations of benzene and ozone. Concentrations of benzene in the ambient air declined almost immediately by about 50 percent. This reflects very closely the amount of benzene reduced by CaRFG. Analysis of ozone ambient air quality data for May through October 1996 indicates that CaRFG accounted for about a 10 percent improvement in ozone in the South Coast and a 12 percent improvement in the Sacramento area. A smaller improvement was found for ozone in the Bay Area.

## IV.

### PROPOSED AMENDMENTS

This chapter discusses the proposed amendments to the CaRFG regulations. The discussion in this chapter is intended to satisfy the requirements of Government code, section 11343.2, which requires that a noncontrolling “plain English” summary of the regulation is made available to the public.

#### **A. Rescind the Winter Minimum Oxygen Requirement in Most Areas of the State**

The staff proposes that the Board rescind the requirement for a minimum of 1.8 percent oxygen in every batch of winter gasoline in areas where a minimum oxygen requirement is no longer needed to achieve and maintain compliance with the NAAQS for CO. These attainment areas comprise most of California outside of Imperial County, the South Coast Air Basin and other parts of the “Los Angeles-Anaheim-Riverside Consolidated Metropolitan Statistical Area”. Appendix C explains the need to continue the winter oxygen requirement in the Los Angeles - Anaheim - Riverside Consolidated Metropolitan Statistical Area and Imperial County.

We are proposing that, except for the Fresno\* and Lake Tahoe CO attainment areas, the rescission take place as soon as possible. For the Fresno and Lake Tahoe areas, we are proposing that there be a two-year delay in the rescission. The delay is because the winter oxygen program will be useful in maintaining the federal and state standards for CO respectfully, in the Fresno and Lake Tahoe areas in the next two years. By the end of this time, the additional benefits from the vehicle fleet turnover will exceed the benefits from the winter oxygenate program.

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\* The “Fresno area” consists of Fresno and Madera Counties, which comprise the Fresno “metropolitan statistical area.” Under the CAA, a winter oxygen program is required within the boundaries of a “metropolitan statistical area” that contains a CO nonattainment area.

The proposed Board Resolution for adopting the amendments to the CaRFG reformulated gasoline regulations will include approval of the amendments as a revision to the California SIP, and will direct the Executive Officer to submit the SIP revision to the U.S. EPA.

## **B. Higher Oxygen Cap Limit**

The staff is proposing that the oxygen cap be raised from 2.7 weight percent to 3.5 weight percent. The change would increase the amount of ethanol that could be used in CaRFG-compliant gasoline. Ethanol is the only practically available oxygenate that the U.S. EPA allows to be added at over 2.7 percent oxygen. The oxygen cap would remain within the valid domain of the current Predictive Model. Along with amending the CaRFG regulations to raise the maximum oxygen cap, the staff is also proposing an amendment to the Board's Predictive Model Procedures to reflect the revised cap limit.

## **C. Issues Regarding the Proposed Amendments**

At the June 5, 1998, workshop on the proposed amendments, issues were raised about increasing the oxygen cap and rescinding the winter minimum oxygen content in CO attainment areas. Regarding the oxygen cap increase, representatives of the ethanol industry expressed concern that, while the proposed oxygen cap of 3.5 percent would allow the use of 10 percent ethanol in CaRFG, this would not result in any increase in the use of ethanol. Before a refiner could use 10 percent ethanol, it would have to adjust other parameters to avoid the increases in oxides of nitrogen associated under the Predictive Model with increases in oxygen content. During the RVP season, the refiners would also have to further reduce the volatility of the base gasoline to avoid increases in evaporative emissions. The ethanol industry felt that, without adjustments to the Predictive Model, refiners would not find it economical to use ethanol. Staff indicated that these concerns would be addressed as staff continue to investigate updating the Predictive Model. However, some of the adjustments suggested by the ethanol industry, such as making the Predictive Model be based on reactivity, may not be possible due to limitations in the data base for the Predictive Model.

Concern has also been expressed that without rescinding the wintertime minimum oxygen requirement in the Fresno area, there would be little increased flexibility in the use of oxygenates in the wintertime. Conversely, concern was expressed that any modification to change the requirements for the use of oxygenates would result in a significant decrease in the use of oxygenates and a loss of environmental benefits from their use. Without an air quality need, there is no justification for the continued use of oxygenates. Since the major benefit is the reduction of CO emissions, staff are proposing elimination of the winter minimum oxygen requirement in CO attainment areas. We emphasize that the basic requirement for the use of oxygen is not proposed to be amended. Any adjustment to the amount of oxygen in a batch of gasoline must be done by use of the Predictive Model and the benefits compared to a reference fuel with oxygen. Finally, without changes to federal law, 70 percent of the state's gasoline must meet the federal requirements of at least an average of 2 percent oxygen year round.

## **D. Technical Changes**

### Winter Oxygen Requirement at Retail Outlets Receiving Infrequent Deliveries

The staff is proposing that retail stations with low through-puts be granted limited relief from the winter oxygen requirement. The current RVP regulation contains a provision, 2262.1(c)(3), that allows a service station to have gasoline with a RVP greater than 7.00 psi if the last gasoline delivery occurred more than 14 days prior to start of the RVP control period. The 1992-1996 winter oxygenate regulation that preceded the current winter oxygen provisions had a similar provision concerning non-oxygenated gasoline. While complying gasoline is delivered long enough before a control period to allow most stations' storage tanks time to be purged of non-complying gasoline by the start of the period, small stations may not receive shipments often enough to accomplish that purge. It would be prudent and appropriate to add that provision back into the current regulation.

### Drafting Error Regarding Averaging

The staff proposes a correction to a drafting error in the current regulations. It affects a refiner who, under the averaging compliance option, supplies a batch of gasoline whose actual property value exceeds the assigned designated alternative limit (DAL) for that property but does not exceed the averaging limit in the regulation. For instance, consider the sulfur content, for which the averaging limit is 30 ppm. If a refiner supplies a "credit" batch of gasoline under a DAL of 20 ppm sulfur but the actual sulfur content is 28 ppm, the drafting error makes the refiner technically not in violation of the regulations even though the DAL has been exceeded. This is *not* a problem when a refiner uses averaging under the predictive model.

The problem arises from the language in sections 2262.2(c), 2262.3(c), 2262.4(c), 2262.6(c), 2262.6(e), and 2262.7(c), which establish the averaging compliance option for the sulfur, benzene, and olefin contents, T50, T90, and the aromatic content respectively. For example, section 2262.2(c) provides that during a period for which a refiner has elected averaging for sulfur, the sulfur content of a batch of gasoline cannot exceed the 30 ppm averaging limit unless the batch is reported as an alternative formulation under the predictive model or vehicle testing options, or unless: (1) a DAL has been set for the batch, (2) the sulfur content does not exceed the DAL, and (3) where the DAL is over 30 ppm, the excess sulfur content is fully offset under the DAL provisions in section 2264. The result of this language is that the (c)(2) prohibition against setting a DAL below the actual sulfur content of a given batch does not apply if the sulfur content does not exceed the averaging limit of 30 ppm.

The proposed amendments to each of the subsections listed above correct this anomaly so that the underlying intent is accurately reflected. Under the amendments, it will always be a violation for a refiner using an averaging compliance option to sell a batch of gasoline that exceeds the DAL set for a property. In this respect, the language parallels the current text in section 2265(b)(1) pertaining to averaging when the predictive model is used. The proposed

amendments also contain changes in section 2262.2(b) (sulfur content) and the parallel provisions for other regulated properties, to better reflect the potential batch-by-batch switches between the flat limits, averaging limits, predictive model alternative formulations and vehicle testing alternative formulations.

#### RVP Limit for Gasoline Shipped between Refineries

A month before the seasonal RVP standard applies throughout the gasoline distribution system in a given air basin, the standard becomes applicable to gasoline batches being supplied from production or import facilities in the basin. This helps assure that complying low-RVP gasoline has worked its way to service stations by the start of the basic control period.

The basic system-wide RVP season starts in the South Coast, San Diego and Southeast Desert Air Basins, and Ventura County on April 1, at least a month earlier than in other air basins such as the Bay Area. Thus all gasoline shipped from production and import facilities in southern California must meet the RVP standard starting March 1. The staff has encountered situations where gasoline produced in the Bay Area is shipped by marine vessel to southern California in March. If this gasoline were imported from outside the state in March, it would have to meet the RVP standard when it was supplied from the site where it was imported, as it would if it were produced in southern California. But, in the situation just described, it is exempt. To correct this inequity, the staff proposes that such gasoline be treated as imported, for the purpose of applying the RVP standard only. The proposed amendments include new section 2262.1(c)(4), which would have that effect.

#### Exemption for Gasoline Used Only to Fuel Racing Vehicles

The staff is proposing an amendment to section 2261(e) to exempt gasoline from the CaRFG regulations and other fuel requirements if the person selling, offering or supplying the gasoline demonstrates that reasonably prudent precautions have been taken to assure that the gasoline is only used to fuel racing vehicles. The current regulations do not include an exemption for gasoline used to fuel racing vehicles. However, the CaRFG regulations are adopted pursuant to the ARB's authority in Part 5 (Vehicular Air Pollution Control), Division 26 of the California Health and Safety Code, and Health and Safety Code section 43001 provides that "The provisions of this part [5] shall not apply to: (a) racing vehicles" (defined in Health and Safety Code section 39048 as "a competition vehicle not used on public highways"). Accordingly, ARB legal counsel have long expressed the opinion that the ARB's motor vehicle fuel regulations do not apply to gasoline used in racing vehicles. The proposed amendment will reflect and implement this conclusion.

#### Correction of References

In addition, the staff proposes that the references in the RVP regulations to the Southeast Desert Air Basin be replaced with references to the Mojave Desert Air Basin and the Salton Sea Air Basin. These would be non-substantive changes made to reflect the Board's re-designation of the area last year.

## **V.**

### **FUTURE WORK**

This chapter describes the continuing work to update the CaRFG regulations and especially the Predictive Model portion of the regulations.

#### **A. Modeling Update**

The staff will continue to work with all interested parties to perform a complete update of the exhaust models in the Predictive Model, including adding new emission data, and adding a late-model (e.g., LEV) vehicle class.

In initial attempts to update the "Tech 4" exhaust models in the Predictive Model (applicable to model years 1986 to 1994), the addition of data that have become available since the adoption of the Predictive Model in 1994 unexpectedly changed the form of the models. The incorporation of these data into the model caused several responses of emissions to fuel properties that do not make engineering sense. For example, there is a quadratic response of NO<sub>x</sub> to T50. No emission study yields this kind of result. This response and other apparent anomalies in the attempt to revise the Tech 4 models are thought to be mathematical artifacts of the multi-variate regression procedure, the undue influence of anomalous data, or unfortunate chance relationships among the independent (fuel) variables in the various studies that are being added in the database.

Also, the data now available for later model-year vehicles (1995 and later model years, e.g. "Tier 1" vehicles and LEVs) are not adequate to model their emissions against all the gasoline properties. Except for sulfur, the terms in draft models relating emissions to individual properties appear to be spurious. This prohibits developing a new vehicle tech group for the Predictive Model until additional data are available.

New emission data may be needed and much statistical diagnosis will be needed to



create updated exhaust models that represent the effects of fuel properties on emissions as technically reasonable as the effects present in the existing Predictive Model. We intend to complete the work by the end of 1999. However, it may be necessary to obtain more data for the later model vehicles, which could involve the time-consuming task of conducting emission tests. Therefore, the updating could take longer than planned. We also will continue to look at incorporating an evaporative emissions model into the Predictive Model.

## **B. Longer-Term Issues**

The upcoming generations of vehicles will incorporate advanced technology for lower emissions and better fuel economy. Automobile manufacturers have indicated that to achieve the design performance in the field, the new technologies may require more tightly controlled values for some fuel properties, especially sulfur content. The automobile manufacturers have already prompted the U.S. EPA to begin considering a nationwide reduction of the sulfur content of gasoline. They have also stated that cleaner certification fuel may be important for achieving future standards.

These factors are likely to require a consideration of possible revisions to the specifications for cleaner-burning gasoline. The staff intends to host discussions among representatives of the refining industry, automobile manufacturers and other interested parties to begin a dialogue on the need for future regulatory changes to the CaRFG regulations.

## **VI.**

### **ECONOMIC AND ENVIRONMENTAL EFFECTS**

This chapter discusses the effects of the proposed amendments on the regulated industry, other potential economic effects and effects on emissions.

#### **A. Costs for Regulated Businesses**

The proposed amendments will not create new compliance costs because they do not impose new requirements. Use of the greater flexibility to use higher or lower amounts of oxygenates is optional. It is anticipated that fuel producers will employ this flexibility only when it is to their net economic benefit.

#### **B. Potential Cost to Consumers**

It is possible that the ability to use 10 percent ethanol in gasoline will result in some increase in the use of ethanol. Also, refiners may elect to reduce the amount of oxygenates used in the winter in the CO attainment areas. Either of these choices could impact the cost to produce gasoline.

Staff would expect the additional flexibility to generally allow fuel production at lower cost, and under most circumstances this would result in either no cost impact or lower costs to consumers.

#### **C. Other Potential Economic Effects**

The proposed regulations will have no direct fiscal effect on any government agency. Any impact would be limited to changes in the production costs of gasoline, if any.

If ethanol is added to gasoline, common-carrier pipelines could lose some business moving gasoline, and railroads could gain business hauling ethanol into California. The production of ethanol in California could increase.

If the use of ethanol increases there could be an impact on federal excise taxes. Current federal regulations provide tax incentives for ethanol and ETBE that are not afforded to other oxygenates. The tax break is 5.4 cents per gallon of gasoline blended with 10 volume percent ethanol; the tax incentive is prorated by the amount of ethanol blended in gasoline. Beginning January 1, 1993, federal law defines three types of ethanol and gasoline blends (gasohol) each with a different tax rate--10 percent gasohol, 7.7 percent gasohol and 5.7

percent gasohol. The tax incentives are prorated to give an equivalent tax to that of the 10 percent ethanol volume. The ETBE incentive provides a 3.1 cent per gallon when blended with gasoline. These tax incentives reduce the amount of money collected for the federal highway fund and subsequently reduces the amount of money available to reapportion back to the states. Other oxygenates do not have tax incentives for their use.

If less MTBE is added to gasoline, producers of MTBE outside of California may lose business.

#### **D. Effect on Air Pollutant Emissions**

Refiners may reduce the amount of oxygen in gasoline if the winter oxygen requirement is eliminated. CO emissions would then increase to a degree proportional to the reduced oxygen content. However, the analysis in Appendix C shows that vehicular CO emissions would remain less than they were in 1995, even under the worst possible case, and would decline annually from the turnover of the vehicle fleet to new vehicles. Also, since 70 percent of the gasoline consumed in California is subject to the minimum oxygen content requirement in the RFG regulations, the potential impact is limited to less than 30 percent of the gasoline.

If the use of oxygen in gasoline is reduced as a result of the proposed amendments, vehicular emissions of hydrocarbons, oxides of nitrogen, and potency weighted toxics should not increase. Refiners will still have to satisfy the Predictive Model, whose purpose is to permit only sets of limits that are equivalent or better than the basic CaRFG limits, including the 1.8 - 2.2 percent range of oxygen content.

However, the increase in the oxygen maximum cap could indirectly render the RVP limit inapplicable to ethanol blends. Health and Safety Code section 43830(g) conditionally exempts gasoline containing 10 percent ethanol (equivalent to 3.5 weight percent oxygen) from the RVP limit. Because the oxygen cap is now at 2.7 weight percent, the RVP exemption has not been available.

The RVP exemption will become available if the ARB raises the oxygen cap to 3.5 weight percent, but it will be subject to the following conditions. Health and Safety Code section 43830(g) states that the RVP exemption for gasoline containing 10 percent ethanol will not apply if ARB finds that the fuel would result in a net increase in the ozone-forming potential of the total emissions, excluding emissions of oxides of nitrogen. The ARB has recently completed a series of vehicle emission tests comparing a fully complying CaRFG gasoline containing 11 volume percent MTBE (2.0 weight percent oxygen) and the same base gasoline blended with 10 volume percent ethanol (3.5 weight percent oxygen). This and a larger body of existing data are being evaluated to determine if the finding can be made.

#### **E. Impact on Water Quality**

The proposed amendments may lead to reduced use of MTBE in gasoline. This change could reduce the potential for MTBE contamination from gasoline leaking from storage tanks and pipelines.

Oxygenates are more soluble in water than are the hydrocarbon species in gasoline. Therefore, when gasoline leaks underground into an aquifer or enters a lake (e.g., in two-stroke engine exhaust), the oxygenate mixes with the water to a greater extent than does the rest of the gasoline. Whatever replaces the MTBE in gasoline could be less soluble than MTBE in water (e.g., aromatic hydrocarbons) or more soluble (e.g., ethanol) and would be present in any future leaks of gasoline.

MTBE has little tendency to adsorb to soil, so that when gasoline with MTBE leaks into an aquifer, it can move from the point of leakage faster than does the rest of the gasoline. Alternative substitute materials could be less mobile. It should be noted that the ultimate magnitude and health consequences due to MTBE in ground water are still not known.

The primary release of MTBE into groundwater is from leaking underground pipes and storage tanks used in the transportation and storage of MTBE-containing gasoline. Thus, the prevention of gasoline leaks is the basic remedy to reduce ground and surface water contamination. The rate of leaks and the number of leaking tanks is expected to be reduced greatly, as the underground storage tank replacement program is fully implemented. To the extent that the proposed regulations result in a reduction in the use of oxygenates (or substitution of ethanol for MTBE), they would lessen, to a small degree, the threat of ground and surface water contamination. However, the effect of the proposed regulations on the overall use of oxygenates, in the near term, is expected to be small because refiners are unlikely to reduce the use of oxygenates due to federal requirements. Also, the replacement of MTBE by the use of ethanol is likely to be limited because of ethanol's limited supply and state and federal limits on volatility.

Recreational boating is thought to be the primary source of MTBE in surface water. In addition, atmospheric MTBE can dissolve in rainwater and enter surface water through storm water runoff. However, both recreational boating and atmospheric sources are believed to result in low concentrations of MTBE in water relative to point sources such as underground storage tanks.

Less importation of MTBE into California, which is by water, could reduce the risk of a marine spill of MTBE. Increased importation of ethanol could increase the risk of a major spill of ethanol.

## References

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